

### **REMARKS**

Applicants' thank the Examiner for the indication of allowable subject matter in the present application specifically Claims 7, 8, 14, 15 and 18-27. This amendment amends Claim 1. Now in the application are Claims 1-38 of which Claims 1, 30, and 35 are independent. Applicants' contend that Claims 1-38 as amended, are patentable and in condition for allowance as discussed below.

#### **Rejection under 35 U.S.C. § 102**

The Office Action rejects Claim 1 as being anticipated by U.S. Patent Application Publication No. US2001/0021217 A1 of Gunther, *et al.* (hereinafter "Gunther").

Applicants' respectfully traverse this rejection on the basis of the following arguments and further contend that Gunther fails to disclose all elements of amended Claim 1, as described below, and hence, does not anticipate the claimed invention.

Amended Claim 1 is directed to a controller for monitoring a temperature of an integrated circuit. The controller includes a first interface for receiving a first value representative of a temperature of the integrated circuit and a second interface for receiving a second value representative of a threshold temperature. The controller further includes a comparator for comparing the first value to the second value to determine whether the first value exceeds the second value and thereby determine if the first value indicates an excessive temperature of the integrated circuit. The first value is produced by an active thermal sensor or a passive thermal sensor formed in the integrated circuit.

Gunther is concerned with an integrated on-chip thermal management system providing closed-loop temperature control of an integrated circuit device. Gunther describes a thermal sensor that includes a programmable voltage source and a reference voltage source, both of which are powered by a current source. The thermal sensor of Gunther further includes a comparator, also powered by the current source. A transmission medium couples the programmable voltage source to the comparator and similarly, a transmission medium couples the reference voltage source to the comparator, which includes an output. The reference voltage source of the thermal sensor provides a relatively constant voltage to the comparator over a temperature range of interest. The programmable voltage source of the thermal sensor generates a voltage value dependent upon the temperature of the die area in the vicinity of the thermal sensor. The

comparator of the thermal sensor compares the voltage value from the programmable voltage source against the voltage value from the reference voltage source and, if the programmable voltage value equals or exceeds the reference voltage value, the comparator provides a high logic level (i.e., a logical 1) on its output; otherwise, the comparator provides a low logic level (i.e., a logical 0) on its output.

Amended Claim 1 is not anticipated by the disclosure of Gunther. Gunther fails to disclose a *controller* for monitoring a temperature of an integrated circuit that includes a comparator for comparing a first value received on a first interface with a second value received on a second interface to determine if the first interface value indicates an excessive temperature of an integrated circuit. Gunther discloses a controller (260) that includes one or more registers to enable control over the behavior of the thermal management system (200). Gunther fails to disclose a *controller* or control element that includes a comparator. Consequently, Gunther does not anticipate amended Claim 1.

The controller of amended Claim 1 provides a significant benefit over the thermal system disclosed in Gunther. Gunther requires each and every thermal sensor to include a comparator to determine whether the die temperature in the vicinity of the thermal sensor exceeds a threshold value. Placement of a comparator in each and every thermal sensor consumes a significant amount of die area as compared to a thermal sensor free of a comparator. Accordingly, placement of the comparator outside of the thermal sensor, for example, in a controller minimizes the die area required by a thermal sensor formed in an integrated circuit. Moreover, placement of a comparator outside the thermal sensor further minimizes self-heating effects in the die contributable to the thermal sensor, which can elevate a sensed die temperature value in the vicinity of the thermal sensor and in turn, detract from a sensor's measurement accuracy. Accordingly, the Applicants' respectfully urge the Examiner to reconsider and withdraw the rejection of amended Claim 1 under 35 U.S.C. § 102.

### **Rejections under 35 U.S.C. § 103**

For purposes of clarity in the discussion below, the respective claim rejections under 35 U.S.C. § 103 are discussed separately.

A. Rejection of Claims 2-5, 9, 11, 13, and 16 under 35 U.S.C. § 103(a):

The Office Action rejects Claims 2-5, 9, 11, 13, and 16 as being unpatentable over Gunther in view of U.S. Patent No. 6,098,030 of McMinn (hereinafter “McMinn”).

Applicants’ respectfully traverse this rejection on the basis of the following arguments and further contend that Gunther in view of McMinn fails to disclose all elements of these claims, as described below and does not render the claimed invention obvious.

Claims 2-5, 9, 11, 13, and 16 depend, either directly or indirectly, from amended Claim 1, and thereby incorporate the novel features of amended Claim 1.

McMinn describes an integrated circuit which includes a temperature modeling circuit for reducing operational activity of the integrated circuit when its operating temperature exceeds a predefined threshold. McMinn discloses that an integrated circuit includes a plurality of sub-circuits A-C, an operational activity control circuit, and a temperature modeling circuit. The temperature modeling circuit of McMinn functions to model in real-time the operating temperature of the integrated circuit.

McMinn like Gunther fails to teach or suggest each and every element of the controller recited in amended Claim 1. The Examiner cites McMinn as teaching or suggesting a number of buffers and for providing a control circuit to thermally profile an integrated circuit in which temperature measurements and threshold temperatures are programmable.

McMinn fails to bridge the factual deficiencies of the Gunther reference. McMinn like Gunther fails to teach or suggest a *controller* for monitoring a temperature of an integrated circuit that includes a comparator for comparing a first value to a second value to determine whether the first value exceeds the second value and thereby determine if the first value indicates an excessive temperature of the integrated circuit. Consequently, Gunther in view of McMinn fail to establish a *prima facie* case of obviousness for neither reference, alone or in combination, teach or suggest each and every element of amended Claim 1. Accordingly, Applicants’ respectfully request the Examiner to reconsider and withdraw the rejection of Claims 2-5, 9, 11, 13, and 16 under 35 U.S.C. § 103(a).

B. Rejection of Claim 17 under 35 U.S.C. § 103(a):

The Office Action rejects Claim 17 as being unpatentable over Gunther in view of McMinn and further in view of U.S. Patent No. 5,873,053 of Pricer, *et al.* (hereinafter “Pricer”). Applicants’ respectfully traverse this rejection on the basis of the following arguments and further contend that Gunther in view of McMinn and further in view of Pricer fails to teach or suggest all elements of this claim, as described below and does not render the claimed invention obvious.

Claim 17 depends, either directly or indirectly, from amended Claim 1 and thereby incorporates the novel features of amended Claim 1. The Pricer reference teaches or suggests a single bit over-temperature/under-temperature output from a number of FETs fashioned as a thermal sensor. Pricer fails to teach or suggest a *controller* for monitoring a temperature of an integrated circuit. In addition, Pricer fails to disclose a *controller* having a comparator for comparing a first value to a second value to determine whether the first value exceeds the second value and thereby determine if the first value indicates an excessive temperature of the integrated circuit. Pricer, in contrast, teaches or suggests a thermal sensor.

Accordingly, Pricer fails to bridge the factual gaps of Gunther and McMinn and therefore the cited references, either alone or in combination, fail to teach or suggest each and every element of Claim 17. Hence, Gunther in view of McMinn and further in view of Pricer fail to establish a *prima facie* case of obviousness. Accordingly, Applicants’ request the Examiner to reconsider and withdraw the rejection of Claim 17 under 35 U.S.C. § 103.

C. Rejection of Claim 29 under 35 U.S.C. § 103(a):

The Office Action rejects Claim 29 as being unpatentable over Gunther in view of U.S. Patent No. 5,838,578 of Pippin, *et al.* (hereinafter “Pippin”). Applicants’ respectfully traverse this rejection on the basis of the following arguments and contend that neither Gunther nor Pippin, alone or in combination, teach or suggest each and every element of Claim 29, as described below and hence, does not obviate the claimed invention.

Claim 29 depends on amended Claim 1 and therefore incorporates the novel features of amended Claim 1.

Pippin discloses the thermal sensor used in Gunther. See Figure 1 of Pippin and Figure 4 of Gunther. Pippin fails to teach or suggest a *controller* for monitoring a temperature of an integrated circuit having a comparator for comparing a first value to a second value to determine whether the first value exceeds the second value and thereby determines if the first value indicates an excessive temperature of the integrated circuit. In contrast, Claim 29 recites a *controller* for monitoring a temperature of an integrated circuit that includes a comparator to determine if the first value indicates an excessive temperature of the integrated circuit.

Neither Gunther nor Pippin, alone or in combination, teach or suggest each and every element of Claim 29. Accordingly, the cited combination of the Gunther reference in view of the Pippin reference fail to establish a *prima facie* case of obviousness. Hence, Applicants' request the Examiner to reconsider and withdraw the rejection of Claim 29 under 35 U.S.C. § 103(a).

D. Rejection of Claim 6, 10, 12 and 28 under 35 U.S.C. § 103(a):

The Office Action rejects Claim 6, 10, 12, and 28 as being unpatentable over Gunther in view of McMinn and further in view of U.S. Patent No. 6,363,490 of Senyk and U.S. Patent No. 5,291,607 of Ristic, et al. (hereinafter "Ristic"). Applicants' respectfully traverse this rejection on the basis of the following arguments and further contend that neither Gunther nor McMinn nor Senyk nor Ristic, alone or in combination, teach or suggest each and every element of these claims as described below and hence, does not render the claimed invention obvious.

Claims 6, 10, 12, and 28 depend directly or indirectly, upon amended Claim 1, and therefore incorporate the novel features of amended Claim 1.

Senyk describes the use of a diode, or a passive device, as a temperature sensing device. Ristic discloses a microprocessor having a monolithically integrated environmental sensor. The microprocessor of Ristic is shielded from an environmental signal by a means for isolation which is specific to the type of sensor used, thereby allowing the sensor to be exposed to the environmental signal.

Ristic fails to teach or suggest a *controller* for monitoring a temperature of an integrated circuit that includes a comparator for comparing a first value to a second value to determine whether the first value exceeds the second value, and thereby determine if the first value indicates an excessive temperature of the integrated circuit. Senyk fails to teach or suggest a *controller* for monitoring a temperature of an integrated circuit that includes a first interface for receiving a first value representative of a temperature of the integrated circuit where the first value is produced by one of an active thermal sensor and a passive thermal sensor formed in the integrated circuit. Senyk is merely concerned with passive thermal sensors (i.e., a temperature sensing diode) and is not concerned with an active thermal sensor, for example, the thermal sensor disclosed in related application entitled an Integrated Temperature Sensor.

Neither the cited Senyk reference nor the cited Ristic reference, alone or in combination bridge the factual deficiencies of Gunther and McMinn and therefore the cited combination of references fails to teach or suggest each and every element of Claims 6, 10, 12, and 28. Accordingly, the cited combination of Gunther in view of McMinn and in further view of Senyk and Ristic fail to establish a *prima facie* case of obviousness. Hence, Applicants' respectfully request the Examiner to reconsider and withdraw the rejection of Claims 6, 10, 12, and 28 under 35 U.S.C. § 103(a).

E. Rejection of Claims 30-32 under 35 U.S.C. § 103(a):

The Office Action rejects Claims 30-32 as being unpatentable over Gunther in view of Pricer. Applicants' respectfully traverse this rejection on the basis of the following arguments and further contend that neither Gunther nor Pricer, alone or in combination, teach or suggest each and every element of these claims, as described below and hence, does not detract from the patentability of the claimed invention.

Claims 30-32 are directed to a controller for monitoring a temperature of an integrated circuit. The claimed controller includes means for receiving a plurality of first values representative of a temperature of the integrated circuit, and means for comparing the plurality of first values to a plurality of corresponding second values representative of a plurality of threshold temperatures. The claimed controller further includes means for determining whether an over-temperature condition of the integrated circuit exists based on an output of the means for comparing.

Gunther fails to teach or suggest a *controller* for monitoring a temperature of an integrated circuit that includes means for comparing a plurality of first values to a plurality of corresponding second values representative of a plurality of threshold temperatures. In addition, Gunther fails to teach or suggest a *controller* that includes means for determining whether an over-temperature condition of an integrated circuit exists based on an output of the means for comparing in the controller. Pricer like Gunther fails to teach or suggest a *controller* for monitoring a temperature of an integrated circuit that includes means for comparing a plurality of first values to a plurality of corresponding second values representative of a plurality of threshold temperatures, and means for determining whether an over-temperature condition of an integrated circuit exists based on an output of the means for comparing. Gunther and Pricer both teach or suggest thermal sensors and not a *controller* for monitoring a temperature of an integrated circuit that includes a means for comparing and means for determining whether an over-temperature condition of the integrated circuit exists based on an output of the means for comparing.

Neither Gunther nor Pricer, alone or in combination, teach or suggest each and every element of Claims 30-32, and therefore fail to establish a *prima facie* case of obviousness. Accordingly, Applicants' respectfully request the Examiner to reconsider and withdraw the rejection of Claims 30-32 under 35 U.S.C. § 103(a).

F. Rejection of Claims 35-38 under 35 U.S.C. § 103(a):

The Office Action rejects Claims 35-38 as being unpatentable over Gunther in view of Pricer. Applicants' respectfully traverse this rejection on the basis of the following arguments and further contend that neither Gunther nor Pricer, alone or in combination, teach or suggest each and every element of these claims, as described below and hence, does not detract from the patentability of the claimed invention.

Claims 35-38 are directed to a method for monitoring a temperature of an integrated circuit. The claimed method includes acts of receiving a plurality of first values representative of a temperature of the integrated circuit, and comparing the plurality of first values to a plurality of corresponding second values representative of a plurality of threshold temperatures. The claimed method further includes an act of

determining whether an over-temperature condition of the integrated circuit exists based on a result of comparing.

Gunther fails to teach or suggest a method for monitoring a temperature of an integrated circuit that includes an act of comparing a plurality of first values to a plurality of corresponding second values representative of a plurality of threshold temperatures. In addition, Gunther fails to teach or suggest an act of determining whether an over-temperature condition of an integrated circuit exists based on a result of the act of comparing. Pricer like Gunther fails to teach or suggest a method for monitoring a temperature of an integrated circuit that includes an act of comparing a plurality of first values to a plurality of corresponding second values representative of a plurality of threshold temperatures and an act of determining whether an over-temperature condition of an integrated circuit exists based on a result of the act of comparing.

Neither Gunther nor Pricer, alone or in combination, teach or suggest each and every element of Claims 35-38, and therefore fail to establish a *prima facie* case of obviousness. Accordingly, Applicants' respectfully request the Examiner to reconsider and withdraw the rejection of Claims 35-38 under 35 U.S.C. § 103(a).

G. Rejection of Claims 33 and 34 under 35 U.S.C. § 103(a):

The Office Action rejects Claims 33 and 34 as being unpatentable over Gunther in view of Pricer and further in view of Ristic. Applicants' respectfully traverse this rejection on the basis of the following arguments, and further contend that neither Gunther nor Pricer nor Ristic, alone or in combination, teach or suggest each and every element of these claims, as described below and hence, does not detract from the patentability of the claimed invention.

Claims 33 and 34 depend, directly or indirectly from Claim 30 and thereby incorporate the novel features of Claim 30.

Ristic like Gunther and Pricer fails to teach or suggest a *controller* for monitoring a temperature of an integrated circuit that includes means for comparing a plurality of first values to a plurality of corresponding second values representative of a plurality of threshold temperatures and means for determining whether an over-temperature condition of the integrated circuit exists based on output of the means for comparing. Hence, neither Gunther nor Pricer nor Ristic, alone or in combination, teach or suggest each and



every element of Claims 33 and 34, and therefore fail to establish a *prima facie* case of obviousness. Accordingly, Applicants' respectfully request the Examiner to reconsider and withdraw the rejection of Claims 33 and 34 under 35 U.S.C. § 103(a).

**Conclusion**

In view of the amendments and remarks set forth above, Applicants contend that this application is in condition for allowance. If the Examiner deems there are any remaining issues, we invite the Examiner to call the undersigned at (617) 227-7400.

Respectfully submitted,

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